

AMENDMENTS TO THE CLAIMS

The following listing of the claims replaces all prior versions of the claims in the application:

1. (Currently Amended) A method for determining a level of ventilatory assist to a ventilator-dependent patient for reducing the risk of respiratory muscle fatigue, comprising:

detecting a respiration-related feature of the ventilator-dependent patient and producing a signal representative of the detected respiration-related feature;

calculating a critical threshold of [[a]] ~~the~~ respiration-related feature, wherein fatigue of a respiratory muscle of the ventilator-dependent patient develops when the ~~critical threshold is reached by the~~ signal representative of the detected respiration-related feature ~~exceeds the critical threshold~~; and

controlling the level of ventilatory assist to the ventilator-dependent patient ~~in relation to prevent the signal representative of the detected respiration-related feature exceeding the critical threshold of the respiration-related feature so as to~~ and thereby prevent fatigue of the patient's respiratory muscle ~~to develop~~.

2. (Currently Amended) A method for determining a level of ventilatory assist as defined in claim 1, wherein:

~~calculating a critical threshold of the respiration-related feature comprises calculating~~
detecting the respiration-related feature comprises detecting a critical signal strength of an electrical activity of the patient's respiratory muscle above which muscle fatigue develops;

calculating the critical threshold comprises calculating a critical signal strength of the electrical activity of the respiratory muscle, wherein fatigue of the respiratory muscle develops when the detected signal strength of the electrical activity of the respiratory muscle exceeds the calculated critical signal strength; and

controlling the level of ventilatory assist comprises preventing the detected signal strength of the electrical activity of the ~~patient's~~ respiratory muscle to exceed the calculated critical signal strength to prevent fatigue of the respiratory muscle.

3. (Currently Amended) A method for determining a level of ventilatory assist as defined in claim 2, wherein calculating ~~[[a]]~~ the critical signal strength of the electrical activity of the ~~patient's~~ respiratory muscle comprises:

calculating a critical value of a relative spectral change of the electrical activity of the ~~patient's~~ respiratory muscle above which long term fatigue of the respiratory muscle develops; and

using the critical value of the relative spectral change to calculate the critical signal strength of the electrical activity of the ~~patient's~~ respiratory muscle.

4. (Currently Amended) A method for determining a level of ventilatory assist as defined in claim 2, wherein calculating ~~[[a]]~~ the critical signal strength of the electrical activity of the ~~patient's~~ respiratory muscle comprises:

determining a critical respiratory muscle force level above which muscle fatigue starts to develop; and

in response to the critical respiratory muscle force level, calculating ~~[[a]]~~ the critical signal strength of the electrical activity of the ~~patient's~~ respiratory muscle under which isometric fatigue of the respiratory muscle does not develop.

5. (Currently Amended) A method for determining a level of ventilatory assist as defined in claim 1, wherein:

detecting the respiration-related feature comprises detecting a transdiaphragmatic pressure of the ventilator-dependent patient;

calculating ~~[[a]]~~ the critical threshold of the respiration-related feature comprises calculating a critical level of ~~[[a]]~~ the transdiaphragmatic pressure of the ventilator-dependent patient above which muscle fatigue develops; and

controlling the level of ventilatory assist comprises preventing the ~~patient's~~ detected transdiaphragmatic pressure to exceed the calculated critical level of the transdiaphragmatic pressure to prevent fatigue of the respiratory muscle.

6. (Currently Amended) A method for determining a level of ventilatory assist as defined in claim 5, wherein calculating ~~[[a]]~~ the critical level of the transdiaphragmatic pressure comprises:

calculating a critical value of a relative spectral change of ~~the~~ an electrical activity of the ~~patient's~~ respiratory muscle above which long term fatigue of the respiratory muscle develops;

calculating a respiratory duty cycle; and

using the critical value of the relative spectral change and the respiratory duty cycle to calculate the critical level of the transdiaphragmatic pressure.

7. (Currently Amended) A method for determining a level of ventilatory assist as defined in claim 1, wherein calculating ~~[[a]]~~ the critical threshold of the respiration-related feature comprises:

detecting a signal strength of an electrical activity of the respiratory muscle;

calculating a first critical signal strength of ~~[[an]]~~ the electrical activity of the ~~patient's~~ respiratory muscle above which muscle fatigue develops; and

determining a critical muscle force level above which muscle fatigue develops and, in response to the critical muscle force level, calculating a second critical signal strength of the electrical activity of the respiratory muscle under which isometric fatigue of the respiratory muscle does not develop; ~~and~~

wherein controlling the level of ventilatory assist comprises preventing the detected signal strength of the electrical activity of the respiratory muscle to exceed either the first and second critical signal strengths to prevent fatigue of the respiratory muscle.

8. (Currently Amended) A method for determining a level of ventilatory assist as defined in claim 1, wherein:

detecting the respiration-related feature comprises:

detecting a transdiaphragmatic pressure of the ventilator-dependent patient; and

detecting a signal strength of an electrical activity of the respiratory muscle;

calculating ~~[[a]]~~ the critical threshold of the respiration-related feature comprises:

calculating a critical level of ~~[[a]]~~ the transdiaphragmatic pressure above which muscle fatigue develops; and

calculating a critical signal strength of ~~an~~ the electrical activity of the ~~patient's~~ respiratory muscle above which muscle fatigue develops; and
~~wherein~~ controlling the level of ventilatory assist comprises:

preventing the detected transdiaphragmatic pressure to exceed the critical level of the transdiaphragmatic pressure to prevent fatigue of the ~~patient's~~ respiratory muscle; and

preventing the detected signal strength of the electrical activity of the ~~patient's~~ respiratory muscle to exceed the critical signal strength to prevent fatigue of the ~~patient's~~ respiratory muscle.

9. (Currently Amended) A method for determining a level of ventilatory assist as defined in claim 1, wherein the ~~patient's~~ respiratory muscle of the ventilator-dependent patient comprises the patient's diaphragm.

10. (Currently Amended) A device for determining a level of ventilatory assist to a ventilator-dependent patient for reducing the risk of respiratory muscle fatigue, comprising:

a detector of a respiration-related feature of the ventilator-dependent patient to produce a signal representative of the detected respiration-related feature;

a calculator of a critical threshold of ~~[[a]]~~ the respiration-related feature, wherein fatigue of a respiratory muscle of the ventilator-dependent patient develops when the ~~critical threshold is reached by~~ signal representative of the detected respiration-related feature exceeds the critical threshold; and

a controller of the level of ventilatory assist to the ventilator-dependent patient ~~in relation~~ to prevent the signal representative of the detected respiration-related feature to exceed the calculated critical threshold of the respiration-related feature so as to and thereby prevent fatigue of the ~~patient's~~ respiratory muscle to develop.

11. (Currently Amended) A device for determining a level of ventilatory assist as defined in claim 10, wherein:

~~the calculator computes a critical signal strength of an electrical activity of the patient's respiratory muscle above which muscle fatigue develops;~~

~~the device comprises a detector of the~~ detects a signal strength of ~~the an~~ electrical activity of the respiratory muscle;

the calculator calculates a critical signal strength of the electrical activity of the respiratory muscle, wherein fatigue of the respiratory muscle develops when the detected signal strength of the electrical activity of the respiratory muscle exceeds the calculated critical signal strength; and

the controller prevents the detected signal strength of the electrical activity of the patient's respiratory muscle to exceed the calculated critical signal strength to prevent fatigue of the patient's respiratory muscle.

12. (Currently Amended) A device for determining a level of ventilatory assist as defined in claim 11, wherein the calculator:

calculates a critical value of a relative spectral change of the electrical activity of the patient's respiratory muscle above which long term fatigue of the respiratory muscle develops; and

uses the critical value of the relative spectral change to calculate the critical signal strength of the electrical activity of the patient's respiratory muscle.

13. (Currently Amended) A device for determining a level of ventilatory assist as defined in claim 11, wherein the calculator:

determines a critical respiratory muscle force level above which muscle fatigue starts to develop; and

in response to the critical respiratory muscle force level, calculates a the critical signal strength of the electrical activity of the patient's respiratory muscle under which isometric fatigue of the respiratory muscle does not develop.

14. (Currently Amended) A device for determining a level of ventilatory assist as defined in claim 10, wherein:

the detector detects a transdiaphragmatic pressure of the ventilator-dependent patient;

the calculator computes a critical level of $[[a]]$ the transdiaphragmatic pressure of the ventilator-dependent patient above which muscle fatigue develops;

~~the device comprises a detector of the patient's transdiaphragmatic pressure; and~~

the controller prevents the ~~patient's~~ detected transdiaphragmatic pressure to exceed the critical level of the transdiaphragmatic pressure to prevent fatigue of the ~~patient's~~ respiratory muscle.

15. (Currently Amended) A device for determining a level of ventilatory assist as defined in claim 14, wherein the calculator:

calculates a critical value of a relative spectral change of ~~the~~ an electrical activity of the ~~patient's~~ respiratory muscle above which long term fatigue of the ~~patient's~~ respiratory muscle develops;

calculates a respiratory duty cycle; and

uses the critical value of the relative spectral change and the respiratory duty cycle to calculate the critical level of the ~~patient's~~ transdiaphragmatic pressure.

16. (Currently Amended) A device for determining a level of ventilatory assist as defined in claim 10, wherein:

the detector detects a signal strength of an electrical activity of the respiratory muscle;

the calculator (a) calculates a first critical signal strength of ~~an~~ the electrical activity of the ~~patient's~~ respiratory muscle above which muscle fatigue develops, and (b) determines a critical muscle force level above which muscle fatigue starts to develop and, in response to the critical muscle force level, calculates a second critical signal strength of the electrical activity of the ~~patient's~~ respiratory muscle under which isometric fatigue of the respiratory muscle does not develop;

~~the device comprises a detector of the signal strength of the electrical activity of the patient's respiratory muscle; and~~

the controller prevents the detected signal strength of the electrical activity of the ~~patient's~~ respiratory muscle to exceed either the first and second critical signal strengths to prevent fatigue of the ~~patient's~~ respiratory muscle.

17. (Currently Amended) A device for determining a level of ventilatory assist as defined in claim 10, wherein:

the detector comprises a first detector of a transdiaphragmatic pressure of the ventilator-dependent patient, and a second detector of a signal strength of an electrical activity of the respiratory muscle;

the calculator (a) calculates a critical level of ~~[[a]]~~ the transdiaphragmatic pressure above which muscle fatigue develops, and (b) calculates a critical signal strength of ~~an~~ the electrical activity of the ~~patient's~~ respiratory muscle above which muscle fatigue develops;

~~the device comprises a detector of the patient's transdiaphragmatic pressure, and a detector of the signal strength of the electrical activity of the patient's respiratory muscle; and~~

the controller (a) prevents the detected transdiaphragmatic pressure to exceed the critical level of the transdiaphragmatic pressure to prevent fatigue of the respiratory muscle, and (b) prevents the detected signal strength of the electrical activity of the ~~patient's~~ respiratory muscle to exceed the critical signal strength to prevent fatigue of the ~~patient's~~ respiratory muscle.

18. (Currently Amended) A device for determining a level of ventilatory assist as defined in claim 10, wherein the ~~patient's~~ respiratory muscle of the ventilator-dependent patient comprises the patient's diaphragm.